(54) Title: TRAFFIC CONTROL SYSTEM FOR REDUCING POLLUTION AND ENHANCING TRAFFIC SAFETY

(57) Abstract: The invention pertains to the system for traffic control for assurance of larger ecological and traffic safety with the aid of the GPS satellite system (1). A Navigator (2) registers engine speed, vehicle speed and transmission ratio appropriate for the vehicle location and advises the driver to change gear in order to reduce fuel consumption. In case no gear shift is carried out, the police is informed and a fine is deducted from a bank account. The invention also monitors whether vehicle speed exceeds a set speed limit, whether the vehicle is about to enter a highway in the wrong direction and permits to track stolen vehicles.
TRAFFIC CONTROL SYSTEM FOR REDUCING POLLUTION AND ENHANCING TRAFFIC SAFETY

Area of technology to which the invention pertains

5 The invention pertains to the system of traffic control for ensuring an increase in ecological and traffic safety

The problem that the invention solves

10 The invention is based on the problem on how to increase ecological and traffic safety with motorvehicles in daily road traffic. The system should automatically control vehicle speed on the whole route on which road traffic occurs. In this the computer compares the vehicle speed in a specific time with the permitted speed on this section of the road. If the vehicle exceeds the permitted speed limit on the section of the road it is using at that time, the driver is warned to adjust the driving speed to the permitted speed on this section of road. The system would force the driver to adjust his driving speed to the legal limit on this section of the road with warnings, advice and commands. For disobedient and dangerous drivers that would not heed the warnings, advice and commands certain sanctions could be implemented because such drivers cause dangerous situations on the road and endanger other traffic participants. In Slovenia, EU and the world there are too many accidents caused by so-called "kamikaze" drivers that are not known and not sanctioned. There are too many drivers like these and the proposed system of control for increasing ecological and traffic safety is meant for them. Slovenia had 293 casualties of traffic accidents in 2007, between the years 1954 and 2004 the number is 21,774 casualties (the same number as the population of the town of Ptuj) and 423,803 injured in traffic accidents. The EU had 46,832 casualties of traffic accidents in 2004 and 44,900 in 2005. The annual costs due to traffic accidents are more than 180 billion EUR, which represents 2% GNP of the Union (EU parliament - news 2005).
The system should automatically control the economical speed of driving with the aid of system control for measuring the vehicle speed, number of revolutions of the motor shaft and the gear shift ratio in the gear box that is in use at the time. The computer would advise the driver how to achieve minimum fuel consumption in different driving conditions using simulations of optimal regimes of motor functioning, driving speed and changing gears. Wasteful (uneconomical) drivers that despite warnings do not heed advice, warnings and commands would be evidenced into a special list. It is known that too large fuel consumption causes additional environmental pollution. A 10% reduction in fuel consumption annually in Slovenia (1.5 million tons in 2006) would mean a decrease of environmental pollution for 471,750 tons of \( \text{CO}_2 \). The fuel consumption in EU (15) was 248 million tons in 2005, reducing consumption for 10% would mean 77,996,000 tons less \( \text{CO}_2 \) released into the atmosphere annually.

The system should instantaneously detect and act in the event that the driver goes the wrong way on the motorway. The system would automatically activate all necessary vehicle signalisation and the driver would get all necessary information, instructions, and measures for the situation he finds himself in.

The system would enable automatic payment of all road (traffic) services. Vehicle theft would be controlled and responsible services would be notified immediately as well as the owner, vehicle movements would be monitored.

The system would enable vehicle tracking, which would be an aid for locating stolen vehicles.

Data on the status of technology or rather the current known solutions and their shortcomings.
The world already knows two satellite navigation systems. The American GPS (Global Positioning System) that has 24 satellites in six orbital planes at the height of 20.200 km. The other is the Russian GLONASS (GLObal NAvigation Satellite System) that also has 24 satellites in three orbital planes at the height of 19.100 km.

The European satellite navigational system Galileo will be comprised of 30 satellites that will circle on three orbital planes at the height of 23.222 km. At this height the earth atmosphere does not affect the position of the satellites. The satellites will circle in three orbital planes. The inclination and covering of the earth's surface is 75 degrees (GPS 55 in GLONASS 64,8 degrees) which enables the Galileo system to optimally cover the earth and is more accurate from the others. Each point (receiver) on earth must be covered with at least three satellites at the same time. This enables a higher degree of accuracy of the measurement in all measurement criteria at the same time. The satellites circle the earth every twelve hours.

For the undisturbed functioning of the satellite system the following conditions must be met:

- Accurate knowledge of the position of the satellites in the system (space)
- The position of the receiver in the vehicle that is measured in relation to the satellites (from 3 to 7 satellites at the same time)
- The distance from the satellite to the receiver is measured in travelling time (speed of light)
- For measuring travel time very accurate clocks are needed.

For the Galileo program two types of atomic clocks are developed: the rubidium atomic clock of a standard frequency and the passive hydrogen maser clock. Accurate clocks are a condition for measuring and determining the exact position of the receiver on earth that is measured and calculated at the same time by at least three to seven satellites. Constant control, undisturbed operation and satellite state is always controlled from earth.
The known GPS navigational devices in vehicle from different manufacturers offer: a highly responsive GPS receiver with audio and video guidance in Slovene and other selected languages that finds the closest road (route) to hospitals, police stations, petrol stations, addresses and intersections. It also writes out the coordinates of our current position, the travelled distance, maximum speed and travel time.

There are several known researches done across the world that deal with the matter of vehicle speed control and with that increased traffic safety that are not comparable and have a different basis for controlling speed and with that traffic safety. There are several USA patents regarding parking spaces that are not comparable with my solution and do not take into account the whole vehicle registration process and other payable services. The list of USA patents: USPAT 6133855; USPAT 62921 10; USPAT 5910782. The Slovene patent SI21 112 A titled "Signalling device for maintaining vehicle speeds within a permissible range" describes a manner of speed control in the title that describes a different method of measuring and has no action toward unconscientious drivers.

The Australian Institute ISA (Intelligent Speed Adaption) has the most and the best solutions and research up till now that are based on the basics of a GPS computer system. Their testing will be concluded in December 2008.

The ISA system will offer a monitoring system that will support (help) the driver anywhere in the road network in such a manner as to offer help in controlling driving speed according to traffic regulation. ISA will have three possible options:

The first option is an open ISA system that only warns the driver visually or through an audio signal that he has exceeded the speed limit, the driver decides on his own if he will reduce his speed or not. It is more of an advisory system. The second option is a semi-open ISA system where the driver does not need to follow warnings about exceeded speed limits. In this event the driving is more risky for the driver that can continue with speeding. The third option is a closed ISA system that affects the driving automatically in such a manner to affect the gas pedal and in this way reduces the speed. This option
is not mandatory and the driver can turn it off according to wish and he can continue driving without additional control. The deficiency of this solution is that there are no preliminary warnings as is foreseen in my invention.

The ISA system is being tested by the Swedish that are going to choose the second option or the semi-closed system. The Dutch have started testing the ISA system in Tilburg. The following countries also plan on testing the ISA system: Belgium, Denmark, Great Britain, Finland, Germany, Hungary and Spain.

It is obvious from this that this invention has many advantages over the ISA system that includes a larger area of traffic and the whole system of ecological and traffic safety, especially sanctions, measures against dangerous drivers, advice, warnings for saving on fuel (ecology), control of right way on motorways, warnings of (over) slow drivers that hinder normal (economical) driving of drivers.

Description of the invention sketch 1/1

The sketch 1/1 represents a macro system for increased ecological and traffic safety in road traffic and a connection with individual subsystems.

1. Satellite system GPS, later Galileo.

2. GPS vehicle Navigator. In function as a driver guardian. Every vehicle that is registered for public traffic has a Navigator. Without a Navigator the vehicle cannot be used for public road transport and can't be registered as a vehicle. The Navigator functions as a mini black box like the one used in aviation. The "key" for accessing and working on the Navigator is kept by the certified service, which must protect all information stored in the memory of the Navigator. In the event of a sale or old age of the vehicle, the data from the Navigator remains the property of the driver forever and are with him till the validity of his driver's licence expires. Communication between the Navigator and the other users that are connected into a functional network is done in GSM frequency.
3. The saver and giving useful advice is an integral part of the Navigator 2.

4. An audio device is a basic acoustic device that gives the driver verbal and other audio signals, instructions, warnings and commands.

5. A collection of all advice and useful warnings, instructions and commands.

6. Police, advice, rescue and repression.

7. Light device (existing) in and outside the vehicle.

8. Collection of all offences of the vehicles with the driver.

9. Reducing the engine strength, reducing the number of revolutions or optionally reducing the flow of fuel.

10. Audio device - more warnings.

11. Additional education of problematic drivers.

12. Registering all traffic accidents of an individual driver.

13. Calculation and registration of fines of individual drivers and drivers in an individual areas.


15. Collection and sorting for the most problematic drivers.

16. A collection of all financial penalties and driver payments.

17. Public works in the institute for rehabilitation of traffic accidents' invalids.

18. Banks of vehicle owners with personal bank accounts.

19. Charging to personal bank accounts of drivers.
Invention description

1. This invention is characterised by the fact that it automatically with the GPS satellite system 1 and through the Navigator 2, Saver 3, Audio device 4 and the Collection of all advice 5 offers, enables, guides and helps the driver in economical driving in such a manner that the Navigator 2 registers, calculates and recommends the number of revolutions of the motor shaft. If the revolutions are too high according to the program for a specific vehicle in the current lower gear and vehicle speed, driving on flat terrain or a mild incline (the inclination of the flat terrain in regard to the base) means uneconomical (wasteful) driving. The programs in the Navigator 2 differentiate according to type of vehicle, type of fuel (petrol, diesel), motor volume, strength, area of maximum torque, the highest revolutions, vehicles with automatic gear shifting and the program for vehicles with manual gear shifting. Economical speed means motor shaft revolutions close to maximum torque, where combustion is best and environmental pollution and additional green house effect is lowest. The driver that presses on the gas pedal too long or too hard in lower gears, except in overtaking (impulse signalling and overtaken vehicle) and when high and too high revolutions surpass revolutions in lower gears, is alerted with the Audio device 4 with the words to change gears up. For the driver that will ignore instructions and warnings the device will register the amount of time in too high revolutions and it is possible that such drivers will pay special taxes for overly polluting the environment that will be registered in the Collection of all violations and instructions 8 and will then be automatically sent to Calculation and registration of fines 13, Collection of all financial payments of the driver 16, Banks of vehicle owners with personal bank accounts 18 and Charging of personal bank accounts of driver 19.

2. The before mentioned invention is characterised by the fact that with the connection to the Satellite system 1 and the aid of the Navigator 2 it warns the driver of speeding in a given moment and on a given stretch of road, where the mandated speed limit is lower with the aid of the Audio device 4. In the event that
the driver ignores the warnings and does not reduce his speed, the Light device outside and inside 7 is activated, after this the Audio device 10 gives stronger warnings after several seconds and no complying and disregarding of these warnings the Motor strength reduction 9 follows in such a manner that the driver can safely reach the first stopping point with a lower speed. At the same time the Police 6 is notified which acts according to the authorisation it has in such cases. After the foreseen formalities are over the vehicle is repaired so it can be used in traffic again, the driver receives a suitable fine that is automatically transferred into Calculating and registering fines 13 and then into the Collection of all financial payments of the driver 16, Banks of vehicle owners with personal bank accounts 18 and lastly into the Charging of personal bank accounts of drivers 19. This invention will help to drastically reduce traffic accidents. That means fewer victims, injured, severely injured, fewer heavily disabled persons, invalids, family traumas, material damage. These measures give us all conditions to discover dangerous "kamikaze" that endanger themselves and others in traffic that usually end with the severest of consequences. At the present such drivers remain mainly undetected, unrecognisable, unprocessed and unpunished. As a last resort it can be or should be possible to confiscate the vehicles of such dangerous drivers.

For incorrigible and too frequent violators of traffic safety there is a Registration of all traffic accidents 12 and a Collection and sorting of problematic drivers 15 is done so that they can be guided, assigned and taken to Additional education of problematic and dangerous drivers 11. The worst persons responsible for accidents and incorrigible drivers are guided towards Public works in an institution 17 for the rehabilitation of invalids caused by traffic accidents.

3. The invention is characterised by the fact that it with the aid of the Satellite system 1 and Navigator 2 immediately after it detects driving on the wrong side of motorway activates the Audio device for all warnings 4 which immediately warns the driver verbally of the grave danger and to take immediate action, the Light device inside and outside the vehicle 7, the Audio device gives stronger warnings 10 and guides the driver to the emergency lane. At the same time power of the engine 9 is reduced, the revolutions of the motor shaft are reduced to the point that the vehicle can go to the very right of the road safely. All the time that the
vehicle is stopped on the emergency lane the Audio device stronger warnings 10 and the Light device outside the vehicle 7 are working. The Navigator 2 disables restarting the vehicle when it is stopped until the appropriate services are in action - Police 6 with advice, rescue and repression (fines as well) 13. The Police enables the Navigator 2 to start the vehicle and escorts it into traffic again. Calculation and registration of fines 13 is done automatically which then is automatically forwarded into the Collection of all financial payment of the driver 16, into the Banks of owners of personal bank account holders 18 and lastly into the Charging of drivers’ personal bank accounts 19. Realising the control of the correct way of driving on motorways will be more effective when the more accurate European navigational satellite system Galileo.

4. This invention is characterised by the fact that it warns drivers verbally with the aid of a Satellite connection 1, Navigator 2 and Audio device 4 that he is driving slower or too slowly in relation to the speed limit and road conditions, or rather that conditions exist that warrant a higher economical speed on a certain road. Vehicles that cause a long queue (minimum three vehicles) with their too slow driving are warned verbally to move out of the way at the first safe section (space) where it is possible to stop safely so others can proceed unhindered, normally, sparingly and safely. The driver that disregards recommendations, instructions and commands to stop the vehicle on an appropriate emergency lane or appropriate safe space in a certain programmed time after the warning is warned by the Audio device for all warnings 4 with a verbal warning first, if the driver disregards this warning it warns him with audio and visual signals. Drivers that habitually disregard warnings and instructions are registered in the Collection of all violations 8. This is automatically sent into Calculation and registration of fines 13, Collection of all financial payments of the driver 16, Banks of vehicle owners with personal bank accounts 18 and the Charging of personal bank accounts of driver 19. Databases with this kind of data are stored and accessible only to authorised personnel in an authorised service and are not for the public but are only meant for taking action against these drivers for repeated disregard of such instruction, fines follow.
5. This invention is characterised by the fact that it automatically and digitally with all necessary registration with the aid of the Satellite system 1, Navigator 2 and the Collection of all payments of road services 14 enables, registers, controls entry and exit to payable roads, tunnels, bridges, ferries, passes and parking places. It sends financial charges automatically to the Collection of all road services 14. It forwards the data to the Collection of all financial means of the vehicle 16. Next the automatic notification of Banks of the vehicle owners with personal bank accounts 18 is done and then the Charging of personal bank accounts of drivers 19. All this communication between all presented systems is automatic in the sense of protecting personal data and is secret (such as phone communication - phone conversations) and is accessible only to the service that is authorised and responsible for this. This system procedure can be included into the system gradually from the time, technical and technological view.

6. This invention is characterised by the fact that it with the aid of the Satellite system 1, Navigator 2 and data from Police 6 about stolen vehicles automatically notifies Police 6 of locations of the stolen vehicles.
PATENT CLAIMS

1. The system for traffic control for ensuring larger ecological and traffic safety is characterised by the fact that it contains the Satellite GPS system (1), Navigator (2), Saver (3), Audio device (4), Collection of all advice (5), Police (6), Light device (7), Collection of all violations (8), Reducing engine strength (9), Audio device (10), Additional education (11), Registration of all traffic accidents (12), Calculation of fines (13), Collection of all road services (14), Collection and sorting of problems (15), Collection of all financial payments of driver (16), Public works in an institution (17), Banks of vehicle owners with personal bank accounts (18) and Charging to the personal bank account of driver (19); that it automatically with the Satellite GPS system (1), and through the Navigator (2), Saver (3), Audio device (4) and Collection of all advice (5) enables, offers, guides and helps the diver in economical driver in such a manner that the Navigator (2) registers, calculates and recommends the number of revolutions of the motor shaft; in the event that they are too high the Navigator (2) according to the program initiates a warning that the vehicle needs to be shifted into a higher gear that the vehicle engine will work optimally; that the programmes in the Navigator (2) differentiate according to individual vehicle types, fuel, engine volume, engine strength, area of maximum torque, area of maximum revolutions for engines with automatic gear shifting and vehicles with manual gear shifting; that economical speed means that engine shaft revolutions are close to maximum torque where combustion is optimum and environmental pollution is smallest; that the Audio device (4) warns the driver verbally to shift the vehicle into a higher gear when he presses the gas pedal for too long and too much in lower gears except when overtaking (impulse turn signal and overtaken vehicle) and when the high too high revolution s of the motor shaft exceed the revolutions in lower gears; that the vehicle whose driver ignores instructions and warnings will register the time in too high revolutions which is a basis for calculating a special fee for
over eco-polluting the environment which is registered into the Collection of all violations and instructions (8); that the information about exceeding time with too high revolutions is automatically sent into the unit for Calculation and registration of fines (13), the Collection of all financial payments of driver (16), into Banks of vehicle owners with personal bank accounts (18) and the warrant for Charging of personal bank accounts of driver (19).

2. The procedure of the use of the system for traffic control for assurance of larger ecological and traffic safety is characterised by the fact that the system can be used wholly or in part with different subsystems that is: subsystem for controlling traffic of ecological safety, subsystem of control of traffic safety.

3. The procedure of use of a subsystem for ensuring ecological safety according to claim 2 is characterised with the fact that it automatically with a Satellite GPS system (1) and then automatically through the navigator (2), Saver (3), Audio device (4) and collection of all advice(5) offers, enables, guides and helps the driver in economical driving in such a manner that the Navigator (2) with the Saver (3) registers, calculates, compares recommends the optimal number of revolutions of the motor shaft for a certain type of the vehicle to achieve a smaller fuel consumption, if the motor shaft revolutions are too high according to the program and are not in accordance with a certain vehicle type in the current (lower) gear and vehicle speed, driving on flat or slightly inclined terrain (the incline of the given flat in relation to base) it means uneconomical (wasteful driving: programs in the Navigator (2) and Saver (3) are different according to different vehicle types, fuel (petrol, diesel), engine volume, strength of engine, area of maximum torque, the maximum number of revolutions, vehicle with an automatic gear shift and a program for vehicles with manual gear shifting, economical speed of vehicle is understood as revolutions of the motor shaft close to maximum torque, where combustion is best and
environmental pollution is smallest, if the motor shaft has too high revolutions according to the program for a certain vehicle in a certain gear, except in overtaking (condition indicator and overtaken vehicle), the Audio device (4) is activated with the spoken word that warns of too high revolutions of the motor shafts and commands a necessary transition into a higher gear: in the event that the command is disregarded, unrealised and instructions and warnings are not heeded, it is automatically registered and managed in the Collection of all offences and instructions (8), after that the Calculation and registration of fines (13) is done automatically, after that follows the Collection of all financial payments of driver (16), the Banks of vehicle owners with personal bank accounts (18) and Charging to personal bank accounts of driver (19).

4. The procedure for use of the subsystem for ensuring traffic safety according to claim 2 is characterised by the fact that it automatically with a Satellite system (1) and automatically with the navigator (2), Audio device (4) warns the driver of speeding on a certain section of road with spoken words: if the warnings were not heeded and realised, the Navigator (2) starts the impulse for reducing the number of revolutions of the motor shaft, the Light device in and outside the vehicle is activated (7), activation of Audio device stronger warnings (10) follows, after several seconds of non-complying of previous instructions and warnings the Reduction of engine strength (9) follows in such a manner that the vehicle can with reduced speed reach the first safe stopping place and at the same time the Navigator (2) automatically reports this to the Police (6) which acts according to the authorisation and instructions for such cases, after the formalities are done and the sanctions are noted the Police (6) again enables the normal engine function which is the condition for safe re-entry into traffic at the same time the legally mandated fine is automatically registered and transferred into Calculation and registration of fines (13) and then into the Collection of all financial payments of driver (16), Banks of vehicle owners with personal bank accounts (18) and lastly into Charging of personal bank accounts of drivers.
(19): for disobedient, irreparable and too frequent violators of traffic safety there is the additional Registration of all traffic accidents of individual drivers (12) and the Collection and sorting of problematic drivers (15) is prepared which then guides, determines and brings to Additional education of problematic and dangerous drivers (11). The worst offenders and irreparable drivers are guided into Public works in an institution (17) for rehabilitation of traffic accidents invalids.

5. The procedure for the use of the subsystem for ensuring traffic safety according to claim2 is characterised by the fact that it automatically disables driving the wrong way on the motorway with the aid of the satellite system (1) and Navigator (2) which immediately detects driving in the wrong direction on the motorway and activates (starts) the Audio device for all warnings (4), which warns the driver with speech about the grave danger and actions to be taken immediately, the Light device in and outside the vehicle (7), the Audio device for stronger warnings (10), Reduction of engine power (9) in such a manner that the driver can drive to a safe spot by the road, the Navigator (2) automatically reports this to the Police (6), which acts appropriately. All of this time light and audio signalisation is working until the Police (6), repairs the Navigator (2), for starting the vehicle and safely escorts (enables) the vehicle into safe traffic mode: automatically Calculation and registration of fines (13) is done, which is then automatically until position (19) continued into the Collection of all financial payments of driver (16), Banks of personal bank account owners (18) and lastly into Charging of personal bank accounts of drivers (19).

6. The procedure of use of the subsystem for ensuring traffic safety according to claim 2 is characterised by the fact that it automatically through the Satellite system (1), Navigator (2) and Audio device (4), warns the driver by speech that is driving too slow, or too slow in regards to the speed limit on that section of the road and is causing a queue of vehicles behind him (at least 3 vehicles) and is disabling them from normal safe driving, he is
warned with the Audio device (4) to stop the vehicle on an appropriate emergency lane or an appropriate safe space, if the driver still doesn't stop and this is repeated many times this type of drivers are registered in the Collection of all violations (8), this is followed by Calculation and registration of fines (13), which is then automatically continued until position (19) into the Collection of all financial payments of driver (16), into Banks of personal bank account owners (18) and lastly into the Charging of personal bank accounts of drivers (19).

7. The procedure for the use of the subsystem for ensuring traffic safety according to claim 2 is characterised by the fact that it automatically enables, ensures a digital unified registration of all road services with the aid of the Satellite system (1), Navigator (2), that registers entry and exit from a payable tolling road, pass, tunnel, bridge, ferry and measures arrival and departure time from parking space and registers, manages and guides all necessary information into the Collection of all payments of road services (14), which is then automatically sent to the position (19), of individual charging of vehicles to financial institutions into the Collection of all road services of vehicles (14) and is then forwarded into the Collection of all financial payments of driver (16), Banks of vehicle owners personal bank accounts (18) and lastly into the Charging of personal bank accounts of drivers (19).

8. The procedure of the use of the subsystem for ensuring traffic safety according to claim 2 is characterised by the fact that every vehicle in traffic has a Navigator (2) and the claim from the first and all other patent claims is that the possibility that it is not only possible, fulfillable and automatic that it enables from the basic concept of vehicle equipment that it can automatically with the aid of the Satellite system (1), Navigator (2) and Police (6), that has data of location in any time about the last position of the
vehicle when it was normally functional and it can determine the position of the vehicle which was stolen.
### INTERNATIONAL SEARCH REPORT

**International application No**
PCT/SI2009/000011

**A. CLASSIFICATION OF SUBJECT MATTER**

INV. B60W30/14 B60R25/00 B60W50/08 B60W30/18

According to International Patent Classification (IPC) or, both national classification and IPC

### B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

- B60W
- B60R

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

- EPO-Internal
- WPI Data

### C. DOCUMENTS CONSIDERED TO BE RELEVANT

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<td>EP 1 548 242 A (SUMITOMO ELECTRIC INDUSTRIES [JP]) 29 June 2005 (2005-06-29) the whole document</td>
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<td>DE 196 00 734 A1 (ZAHNRAFDABRIK FRIEDRICHSHAFEN [DE]) 17 July 1997 (1997-07-17) the whole document</td>
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- [X] Further documents are listed in the continuation of Box C.
- [X] See patent family annex.

- 'A' document defining the general state of the art which is not considered to be of particular relevance
- 'E' earlier document but published on or after the international filing date
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**Date of the actual completion of the international search**

4 August 2009

**Date of mailing of the international search report**

12/08/2009

**Name and mailing address of the ISA/**

European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk

Tel. (+31-70) 340-2040, Fax (+31-70) 340-3016

**Authorized officer**

Plenk, Rupert
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